WORKING PAPER: 1302-4 January 25, 1980

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Much of this research was conducted while I was a Research Fellow at the Brookings Institution. Additional support was provided by The Ford Foundation and grant number 95-P-97176/3-01 from the Health Care Financing Administration, United States Department of Health, Education and Welfare. I would like to thank Jack Hadley, Charles Mallar, Louise Russell, and David Salkever for their comments and suggestions. The views expressed in this paper are mine and do not necessarily reflect the positions of either The Urban Institute or The Brookings Institution.

ABSTRACT

This paper examines the relationship between medical students' practice plans and residency plans. The paper concludes that most students surveyed knew where they wanted to practice and that, unless otherwise constrained, students who knew where they wanted to practice tended to apply to programs there. This finding suggests that the Weistcotten literature and its apparent policy implications should be evaluated critically. In particular, the results call into question the rationale for unrestricted subsidies of undergraduate and graduate medical education by the states.

This paper presents new evidence which challenges the conventional wisdom that the location of graduate training strongly influences a physician's practice location choice. The paper suggests that the causality is reversed: Students' practice plans influence the residency programs to which they apply. This reinterpretation of the residency-practice nexus questions the rationale of state medical education subsidies designed to improve the distribution of physicians.

A consensus has emerged that some regions, particularly the South, and some types of communities, notably rural areas and small towns, are likely to face continuing shortages of physicians.[1] Most economists would argue that these locales generate insufficient effective demand (measured as real compensation per hour) to overcome the non-market attractions of other areas.[2] Another point of view emphasizes supply-oriented topics such as physicians' preferences for urban environments. Although the two viewpoints differ in emphasis, both tend to accept Fein's conclusion that the settlement patterns of young physicians hold the key to any spatial redistribution of physician resources.[3]

Thus far, most efforts to influence young physicians' location decisions have focused on the medical education system. By far the most extensive of these efforts have been state subsidies for medical schools (usually combined with preferential admission for in-state residents.)[4] One motivation for state support of medical schools has been the notion that physicians who are trained in a state are likely to stay and practice, so state subsidies help to insure an adequate supply of physicians. This hypothesis, however, has not fared well in empirical analysis.

It appears that, although there is some tendency for physicians to practice where they attended medical school, the location of medical school training does little to change location patterns.[5] It may be, in other words, that state subsidies to medical schools (which hold down tuition costs) reward physicians for doing what they planned to do in any event. If correct, this perception suggests a major policy conclusion: State support for undergraduate medical education may be an ineffective way to alter the distribution of physicians.[6]

The same strand of research which downplays the importance of undergraduate medical training appears to suggest, however, that the location of graduate training is a significant factor in physicians' location decisions.[7] This "Weiskotten" approach simply notes the correlations between a physician's place of birth, place of medical school training, place of graduate training, and place of first practice. As can be seen in Table 1, the Weiskotten approach appears to show that place of graduate training has a major effect on physicians' location decisions. Over three-fifths of the physicians located in the state in which their graduate training took place.

The impact of graduate training apparently is still significant when other factors are taken into account. Yett and Sloan found that, even after incorporating economic and amenity variables, graduate training in a state increased the probability of locating there.[8] Yett and Sloan concluded, moreover, that "few physicians are likely to select the state in which they plan to practice, and then to seek out post-graduate training in the state regardless of their previous attachment to the state."[9] This contention, if correct, suggests that state policies might well focus on graduate, not undergraduate, medical training. Some states have in fact begun programs designed to attract residents.[10]

This paper challenges the Yett-Sloan contention. I present evidence from a survey of 1977 fourth-year medical students which shows that students tended to choose residencies where they planned to practice. First, I show that most of the respondents knew where they hoped to practice. Then I show that those who knew where they planned to practice tended to choose programs there. Since I have shown elsewhere that students systematically rank favorably located programs above less favorably situated programs, *ceteris paribus*,[11] it seems reasonable to revise the Yett-Sloan formulation: Physicians are likely to seek out post-graduate training in the state in which they hope to practice even with no previous attachment to that state, although previous attachment increases that likelihood.

These results are consistent with the perception that it is advantageous for residents to train where they hope to practice,[12] so that manipulation of the distribution of residents is unlikely to have dramatic effects on young physicians' location patterns. It should be stressed, however, that this paper does not assess the independent effect of residency location on practice location. The paper merely shows that the Weiskotten literature and its apparent policy implications should be evaluated critically.

The paper is divided into six sections. Section II outlines a simple model of career choice. Section III describes the data underlying this paper. Section IV discusses students' location plans. Section V analyzes the relationship between practice and residency plans. Section VI explores the policy and research implications of this paper.

Table 1

The Weiskotten Contact Pattern
for 1955-1965 Medical School Graduates

CONTACT GROUP	PERCENTAGE PRACTICING IN THE SAME STATE AS
BMG	28.0
BM	5.2
BG	6.6
B	4.3
M	2.0
MG	10.6
G	19.5
NO CONTACT	23.8

B denotes state of birth; M denotes state of medical school training;

G denotes state of graduate training.

Table 1 is taken from Table 3, p. 40, in Jack Hadley, Models of Physicians' Specialty and Location Decisions, Technical Paper No. 6, The National Center for Health Services Research, Washington, D.C. (1975).

II. A Simple Model of Practice Location Choice

Figure I depicts a simple heuristic model of physicians' location choices. Medical school selection and socialization policies have an impact by affecting the preferences of fourth year students. If the characteristics of the entering class or the curriculum are changed, the distribution of preferences among graduate may well be different. So, such policies as preferential admissions for students with rural backgrounds or clinical rotations outside the environment of the teaching hospital affect choices by changing tastes. Even if the tastes of the general population or the environment faced by students are seen as being immutable, selection and socialization policies can have an impact.

The limits to this notion should be made clear. First, selection and socialization policies are unlikely to affect established practitioners, so the effects will not be immediate. Second, even if selection and socialization policies strongly affect students' preferences, market factors will also influence students' personal and professional goals. Even if many physicians have well-defined preferences and are relatively unresponsive to these market factors when choosing goals, enough physicians may respond so that the marginal response of the group is of some magnitude.

Two points should be made about the role of market factors in students' choices of personal and professional goals. First, market factors are used in the broadest sense. Not only traditional economic concerns, but also considerations such as the availability of educational opportunities for the student's spouse or the concentration of teaching hospitals in large cities are included in this category. Second, the interaction of market factors with selection and socialization policies must be borne in mind. A student who might be willing--even eager--to consider a rural practice may find that conflicts with his or her spouse's career plans make such plans unrealistic. A student with a strong

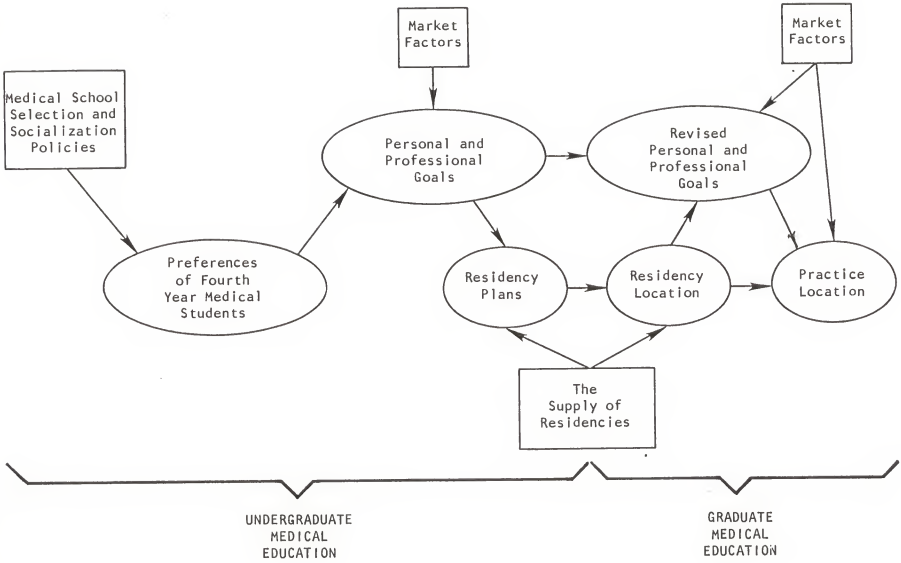
preference for urban living, in contrast, might be willing to accept a lower income to do so. Policies which shape the market factors faced by students may complement or counter selection and socialization policies.

Note that Figure 1 asserts that students' professional and personal goals incorporate the diverse effects of selection, socialization, and market factors. This permits economy in analysis, for having information about these goals focus on later decisions (a) without fully specifying the effects of selection, socialization, or market factors on students' plans and (b) without being concerned that omission of these factors will bias the results. Students' goals summarize these influences.

Figure I outlines in some detail the relationships among students' goals, residency plans, and initial practice locations. Students' goals and their expectations about the availability of residencies affect residency plans. Those plans, again constrained by the availability of desirable programs, determine to which program each student will be assigned.

The key relationship from the point of view of this paper is between goals and residency plans. Two questions must be addressed: By the time they are ready to choose a residency do most students know where they want to practice? If they know where they want to practice, does this affect their residency plans? That the answer to both questions should be "yes" is not implausible. Some students may associate a desirable way of life with a particular area. Others may wish to live near friends or family. The rationale is not of much concern at present, however, only whether or not some students develop location plans before they choose residency programs. If students know where they would like to practice, it is quite reasonable to suppose that this would affect their residency choices. The professional contacts made during residency training are likely to make practice nearby more rewarding professionally and financially,

Figure 1
A Model of Physicians' Location Choices



especially during the early years of practice. Hospital privileges, referrals from other physicians, and offers to join established groups are likely to be easier to obtain as a result. The physician may elect to practice elsewhere, but will forego the benefits of residency-related contacts.

If students develop practice location plans before they choose residencies and if their practice plans influence the programs to which they apply, then any attempt to relate practice location to residency location without information about students' practice plans will significantly overstate the importance of residency location in practice location choice.[13] A part of the observed correlation will merely reflect students' successes in securing desirable residencies. It is not suggested that residency location has no effect on practice location. Figure I clearly suggests otherwise. It is suggested, however, that the observed correlation does not reflect the marginal effect of residency training on practice location. This means that the inferences commonly drawn from the Weiskotten literature are not correct.

III. Data

Data limitations have obscured the relationship between residency and practice locations. To confront this problem, a survey of senior medical students was fielded during January of 1977. The mailing of questionnaires took place after students submitted rankings to the National Intern and Resident Matching Plan, but before matches were announced. This strategy was designed to maximize both response rates and the quality of information received. Not only would students' interest in residency programs be high, but information would be fresh and uncensored by disappointments encountered in the matching process.

The population of students surveyed was geographically concentrated. Questionnaires were mailed to 719 fourth-year medical students at five Eastern medical schools: the State University of New York at Buffalo, Temple University, Johns Hopkins University, George Washington University, and the University of Maryland.

Four considerations prompted the decision to limit the survey to a small number of schools. First, the research project was seen as a pilot study, so a modest sample size was deemed acceptable. Second, limiting the study to a few schools permitted generalization about the population surveyed, even with a modest sample size. Third, surveying students at a few schools simplified the mechanics of conducting the survey and limited costs. Since resources were limited, both considerations were of interest. Fourth, limiting the number of schools permitted selection-socialization efforts to by analyzed quite simply. Each school was viewed as a treatment variable and served as a proxy for a number of selection-socialization differences, although this role did not figure in this phase of the research.

Questionnaires were sent by mail. Financial constraints and the anonymity of responses precluded follow-up mailings. The overall response rate was 49.7 percent. The highest rate for an individual school was 53.9 percent; the lowest was 45.5 percent. A comparison of respondents with all those surveyed was made on the basis of sex. As can be seen in Table 2, the proportion of women among respondents was not significantly different from the proportion of women in the relevant population

These results are consistent with the hypothesis that respondents were representative of those surveyed. Extrapolating results from this sample to all medical students is, however, much more risky.

Table 2

COMPARISON OF RESPONDENTS WITH ALL THOSE SURVEYED

	MARYLAND	GEORGE WASHINGTON	BUFFALO	JOHNS HOPKINS	TEMPLE
NO. RESPONDENTS	83	78	61	63	73
NO. OF FEMALE RESPONDENTS	12	19	13	10	15
PERCENTAGE OF RESPONDENTS WHO ARE FEMALE	14.5	24.4	21.3	15.9	20.5
PERCENTAGE OF POPULATION WHO ARE FEMALE	15.4	23.9	21.6	14.8	18.9

A comparison of the number of female respondents with the number predicted by the proportion of women among those surveyed yielded a raw Chi-square of 0.21. With 4 degrees of freedom, $p>.99$ that this is due to chance.

IV. Students' Location Plans

Most students had a fairly specific notion of where they would like to practice.[14] Indeed, only 16.3 percent of the sample had no idea of where they hoped to practice.

As may be seen in Table 3, nearly half of the students identified a specific location when queried about practice plans. Table 3 also explores the hypothesis that students oriented toward full-time clinical careers would be more likely to articulate specific location goals. In fact, the overall distribution of responses from clinically-oriented students was not significantly different from the distribution of responses from academically-oriented students. Clinically-oriented students were, however, more likely to mention a specific area (Chi-square significant at the 0.1 level) and less likely to respond "don't know" (0.05 level).

Table 4 tabulates students' locale and location preferences.[15] Again, no clear patterns emerge, although students planning to practice in a large city were more apt to identify a specific location. This is probably a coding problem. Large cities are the least specific responses which would be coded "a specific response."

It must be remembered that students without firm location plans are the most interesting from a policy perspective. These are the students whose practice plans are most likely to be affected by policy changes, including changes in the geographic distribution of residencies. Can these students be identified easily? The answer appears to be "no" and Table 5 suggests that multivariate analysis does little to clarify the situation. In the probit equation reported there, the only unambiguous

result is that the probability of responding "don't know" decreases with the number of children a student has. Marital status alone has no effect. This seems reasonable, since the larger a student's family the greater the costs of uprooting it and the greater the incentive to settle down. It also appears that students with better academic records (those with research experience and high class ranks) are more likely to be undecided about their location plans, but these effects are not significant at conventional levels. It is difficult to predict on the basis of these characteristics who will not have firm location plans and maybe responsive to changes in the environment.

In sum, most students knew where they wanted to practice. In the next section I show that, unless otherwise constrained, students who knew where they wanted to practice tended to apply to programs located there.

Table 3

Location and Career Preferences[a/]

	FULL-TIME CLINICAL	SOME TEACHING	TOTAL
DON'T KNOW	20[b/]	40	60
	13.3[c/]	19.2	16.8
REGION	28	55	83
	18.7	26.4	23.2
STATE	12	14	26
	8.0	6.7	7.3
SPECIFIC	78	88	166
	52.0	42.3	46.4
SEVERAL AREAS	12	11	23
	8.0	5.3	6.4

a. See footnote 14 for a discussion of the coding terminology.

b. The number in the cell.

c. The column percentage.

The raw chi-square = 7.04. With 4 degrees of freedom significance = 0.1339.

Table 4

Locale and Location Preferences[a/]

LOCATION	LOCALE: RURAL	TOWN	SMALL CITY	LARGE CITY	ROW TOTAL
DON'T KNOW	7[b/] 12.1[c/] 16.3[d/]	9 15.5 11.1	26 44.8 20.6	16 27.6 15.1	58 16.3
REGIONAL	12 14.5 27.9	21 25.3 25.9	30 36.1 23.8	20 24.1 18.9	83 23.3
STATE	4 15.4 9.3	9 34.6 11.1	11 42.3 8.7	2 7.7 1.9	26 7.3
SPECIFIC LOCATION	17 10.2 39.5	35 21.1 43.2	50 30.1 39.7	64 38.6 60.4	166 46.6
SEVERAL LOCATIONS	3 13.0 7.0	7 30.4 8.6	9 39.1 7.1	4 17.4 3.8	23 8.5
COLUMN TOTAL	43 12.1	81 22.8	126 35.4	106 29.8	356 100

Notes: a. Footnote 14 describes the location coding terminology; footnote 15 describes the locale coding.

b. The number in the cell.

c. The row percentage

d. The column percentage

The raw chi-square = 19.03. With 12 degrees of freedom significance = 0.0877.

Table 5

THE PROBABILITY OF RESPONDING "DON'T KNOW"[a/]

VARIABLE	COEFFICIENT	T-STATISTIC
RESEARCH EXPERIENCE[b/]	0.42389	1.8144
CLASS RANK SQUARED[c/]	0.79501	1.6039
OLDER THAN 28[b/]	-0.39153	-1.0831
MARRIED[b/]	0.26694	0.72440
ENGAGED[b/]	-0.24113	-0.75733
FEMALE[b/]	-0.13758	-0.46066
BLACK[b/]	0.39020	0.65939
NUMBER OF CHILDREN	-0.26184	-2.3206
RURAL HIGH SCHOOL[b/]	0.23878	0.69100
CITY HIGH SCHOOL[b/]	0.30886	1.2268
CONSTANT	-1.7185	-4.1664

N = 357
LOG OF LIKELIHOOD FUNCTION = 204.46

Notes: a. The dependent variable is binary, equalling one if the student responded "don't know," zero otherwise. A probit model is assumed.

b. Binary variable

c. The variable is actually (class rank squared) ÷ 10,000.

V. Location Plans and Residency Applications

In addition to general information about career plans, students were asked to list the programs which were ranked for the National Intern and Resident Matching Program.[17] This was combined with information on practice plans to compute the statistic

$$C_{jk} = \begin{cases} 1 & \text{if the } j\text{th program is located where} \\ & \text{student } k \text{ wants to practice.} \\ 0 & \text{Otherwise.} \end{cases}$$

This was used to compute

$$R_k = \sum_j C_{jk}/N_k,$$

with N_k the number of programs listed by student k. So, R_k is the proportion of each student's choices which were located where the student planned to practice.

There are two conceptual difficulties with C_{jk}, hence with R_k. One difficulty can be resolved; the other is intractable.

The first problem is that some students were much more specific than others when they identified their practice plans. Unless accounted for, these differences in plans could undermine comparisons. It seems likely, for example, that students with specific location plans would be more likely to apply to programs located where they planned to practice. The less specific a student's plans, on the other hand, the higher will be the probability that $C_{jk} = 1$, even if location did not influence the student's residency choices. To permit a sorting out of these factors, data on the specificity of students' preferences (described in Table 3) were retained as control variables.

The second problem is that there is no natural unit with which to describe location decisions. Analysis of units as large as states and as small as city blocks can be justified, yet border crossing makes any geographic unit somewhat arbitrary. With several exceptions, C_{jk} was computed with respect to states. If a program were in state in which the student planned to practice,

C_{jk} was set equal to one. The exceptions to that rule involved large states with multiple centers of graduate medical training: California, New York, and Pennsylvania. These states have regions, such as Northern and Southern California, with markedly different lifestyles and students generally recognized these distinctions. In recognition of this, C_{jk} was computed on the basis of these within-state areas, so that a student interested in practicing in Philadelphia would have C_{jk} set to zero for a program in Pittsburgh.

The structure of the model to be estimated is quite simple

$$R_k = F[I_k],$$

with F( ) a general (possibly non-linear) function and I_k a linear index. The arguments in I_k are (as discussed in Section II) personal and professional goals plus personal and institutional constraints on choice. In terms of operational variables, the model may be written as

$$R_k = F[\alpha_o + \alpha_1(\text{HSL}) + \alpha_2(\text{CLL}) + \alpha_3(\text{KN2}) + (\text{KN3})(\alpha_4 + \alpha_5(\text{SPECIALTY}) + \alpha_6(\text{RURAL PRACTICE})) + \alpha_7(\text{CLINICAL}) + \alpha_8(\text{NON-NIRMP}) + \alpha_9(\text{SUPPLY}) + \alpha_{10}(\text{AGREE}) + \alpha_{11}(\text{CAREER}) + \alpha_{12}(\text{LOCATION}) + \alpha_{13}(\text{BLACK}) + \alpha_{14}(\text{FEMALE})].$$

Table 6

HSL--set equal to one if the student would prefer to practice in his or her high school locale; zero otherwise.

CLL--set equal to one if the student would prefer to practice in his or her college locale; zero otherwise.

MDL--set equal to one if the student would prefer to practice in his or her medical school locale; zero otherwise.

KN3--set equal to one if the student identified a county, city, town, or other well-defined subregion of a state as his or her preferred practice location; zero otherwise.

KN2--set equal to one if the student identified a state; zero otherwise.

CLINICAL--set to one if the respondent preferred full-time clinical practice; zero otherwise.

NON-NIRMP--set equal to one if the respondent did not participate in the matching program; zero otherwise.

AGREE--set equal to one if the student and spouse agreed on their preferred location.

CAREER--set equal to one if a conflict between the spouse's career and the student's residency plans was reported; zero otherwise.

Table 6 - (continued)

LOCATION--set equal to one if a conflict between residency plans and the spouse's location plans was noted; zero otherwise. Note that LOCATION is not equal to 1-AGREE but the correlation between the two is negative.

RURAL PRACTICE--set equal to one if the student preferred to practice in a rural area; zero otherwise. Other practice-type dummy variables were defined (such as TOWN and SMALL CITY), but all entered the estimated equations insignificantly, both individually and jointly.

SUPPLY--the relative supply of residencies for the state in which the student preferred to practice. Supply is computed as the ratio of the number of residency programs in the state relative to to mean number of programs per state.

SPECIALTY--set equal to one if the student planned to enter a particular specialty; zero otherwise.

BLACK--set equal to one if the student's reported race was Black; zero otherwise.

FEMALE--set equal to one if the student's sex was reported as female; zero otherwise.

Table 6 defines the variables in the model. Table 7 reports the results of the regression of R_k on these variables. The analysis was limited to students who listed at least one program and who were not planning to enter the military.[17] Because there was a concentration of observation at zero (nearly 14 percent), ordinary least squares was deemed an inappropriate statistical methodology. Tobit, a non-linear regression technique, was applied to the data.

Table 7

VARIABLE	COEFFICIENT	T-STATISTIC
HSL	0.23764	4.03
CLL	0.05970	1.10
MDL	0.10493	2.08
KN2	-0.09098	1.26
KN3	0.09304	1.22
RURAL PRACTICE x KN3	-0.29766	3.03
CLINICAL	0.11649	2.82
NON-NIRMP	0.18175	2.45
SUPPLY	0.02247	2.28
AGREE	0.06187	1.39
CAREER	-0.14249	2.46
LOCATION	0.02488	0.47
BLACK	-0.17886	1.66
FEMALE	-0.09609	1.85
INTERNAL MEDICINE x KN3	-0.23000	2.82
FAMILY PRACTICE x KN3	-0.29690	2.82
OBSTETRICS x KN3	-0.29025	2.42
PEDIATRICS x KN3	-0.23740	2.26
SURGERY x KN3	-0.32156	3.37
CONSTANT	0.34521	7.12

LOG OF LIKELIHOOD FUNCTION = -105.58
STANDARD ERROR OF ESTIMATE = 0.31718

NUMBER OF OBSERVATIONS = 280
NUMBER AT ZERO = 38

The three "Weiskotten" variables -- HSL, CLL, and MDL -- merit first consideration, although it should be noted that these represent plans, not the historical events reported in the Weiskotten literature. All are positive, with both HSL and MDL achieving statistical significance. In other words, students planning to practice where they grew up or where they

attended medical school were likely to list programs located there. A reasonable inference seems to be that students planning to practice in a known place gave more weight to location when considering programs.

The Weiskotten variables HSL, CLL, and MDL enter the equation as shift variables without interaction effects. This specification was forced, to some extent, by the size of the sample, which limited the number of sub-populations for which estimates could be computed. The sample was, however, split into HSL and non-HSL groups. This failed to improve the model's goodness-of-fit significantly.[18]

The sample size also prevented including interaction terms such as (HSL)x(CLL). This reduces comparability with other Weiskotten models, which considered distinctions such as HSL versus (HSL)x(CLL).

KN2 and KN3 were included in the equation to control for differences in the specificity of students' plans. Neither is significant at conventional levels. The final specification incorporates, however, an interaction between KN3 and RURAL PRACTICE and SPECIALTY. This specification is based on preliminary results which showed that these variables were significant only for students with the most specific plans.

The interpretations of the coefficients for the variables (KN3) x (SPECIALTY) are not self-evident. The estimates imply that, among physicians who identified specific practice plans, those who planned to enter OTHER specialties (the reference group) chose more programs located where they hoped to practice. Not only are those included in the OTHER category a heterogenous group, but the specialty-specific responses found in Table 7 need not reflect common influences. For some, especially Family Practitioners,

part of the negative effects may be due to the unavailability of attractive programs. For others, the negative effects may reflect differences in tastes. The negative coefficient for (KN3)x(RURAL PRACTICE), in contrast, appears to represent a pure supply effect. Respondents with a non-zero value for (KN3)x(RURAL PRACTICE) have (a) indicated, by choosing Rural Practice, that life-style is more important than financial or professional rewards; (b) indicated, by specifying a specific location, that they have a clearer picture of where they hope to practice than most other students. Both of these characteristics lead one to expect a positive coefficient for (KN3)x(RURAL PRACTICE). The estimated negative coefficient is therefore attributed to the limited number of attractive residency programs located in or near rural areas.

The positive coefficient for CLINICAL indicates that students who preferred full-time clinical practice were more likely than others to choose residencies in or near where they hoped to practice. This result was expected. It is precisely the prospective practitioner whom one would expect to be most concerned about making a smooth transition from residency to practice.

Although predictable, this result has unfortunate implications for policies which attempt to alter students' location plans. The students labeled CLINICAL here may reasonably be seen as prospective primary care practitioners. As a group, they are more likely to know where they want to practice and more likely to seek residency programs located there. They are, as a consequence, likely to be less responsive to incentives to practice elsewhere. They also are prime contributors to the observed correlation between residency and practice location, the reason being that they tend to seek out programs located where they hope to practice.

Another negative policy conclusion can be drawn from the coefficient for NON-NIRMP. The positive coefficient indicates that non-participants in the National Intern and Resident Matching Program were likely to choose programs where they planned to practice. This suggests that the reduced rate of participation in the NIRMP in part reflects the perception of some students that they can do better outside the matching plan. One must remember that the NIRMP was designed for an environment with many places and few applicants. With higher fill rates, in constrast, the incentives for students to go outside the system increase, because the probability of matching with a very desirable program has dropped. This estimate suggests once again, though, that students tend to choose programs on the basis of practice plans.

Spouses' plans had an impact on students' residency plan. In particular, if a student's residency plans conflicted with his or her spouse's career plans (CAREER), selection of favorably situated programs was less likely. Agreement about location plans (AGREE) tended to increase the proportion of listed programs located in the agreed-upon area (although the effect was not significant at conventional levels). Disagreement about location preferences (LOCATION), on the other hand, had little impact. Clearly the roles of spouses must be given more attention in future research and policy designs, for the joint spouse-physician location decision embodies both a problem and an opportunity for policymakers. The problem is that the career goals of the physician's spouse must be considered as well as the goals of the physician. The opportunity is that communities which address this issue explicitly will have an advantage when recruiting physicians, so another policy option emerges.

Students responded conventionally to the availability of residency programs. SUPPLY, which measures the relative number of programs in the state, had a significant positive coefficient. The more programs available, the more students tended to choose programs where they wanted to practice. This suggests that altering regional supplies of residency programs may influence students' choices. Students will be more likely to consider programs located in shortage areas if the number of programs elsewhere is reduced. By the same token, students interested in practicing in shortage areas will be deterred from seeking residency training there if the supply of acceptable programs is limited.[20]

No specific hypotheses prompted the inclusion of race and sex dummies. Their presence in the equation reflects an unwillingness to exclude the hypothesis that different behavior patterns might be observed for these minorities. As may be seen, the current estimates throw little light on the issue. Both coefficients are negative. Neither is clearly significant, yet both are too near statistical significance to exclude. A meaningful interpretation of these coefficients requires additional research and will not be attempted here.

VI. Research and Policy Implications

It seems fair to conclude that the students surveyed here tended to choose residency programs located where they hoped to practice. This finding is consistent with other surveys of students' goals in selecting graduate training positions.[21] All have shown that the "location" of a program is an important attribute, although these studies have not emphasized the link between practice plans and the desirability of a program's location.

If students' practice plans influence their residency choices, there are both policy and research consequences. First attention will be given to policy issues.

A number of states have initiated programs designed to attract physicians to targeted residency programs. The results of this paper challenge the assumptions underlying targeted residency programs. There is no question that residents can supply valuable medical services--if predominantly inpatient services--to local populations. How many, if any, of these residents will remain in office-based practice after completing the program is not clear. A case can be made that few physicians will stay to practice if the area is not otherwise attractive. Presumably, physician-short areas are precisely those which are not perceived as being attractive. A cynic would suggest that, by themselves, targeted residencies would be successful in attracting physicians to locations in which no shortage exists. At the very least, critical evaluation of state support for targeted residency programs (a fortiori, for medical school subsidies) is needed.

Suppose that the skeptical view is essentially correct. What policy options remain? Three major approaches stand out.

a) Changing medical school curricula and admissions policies to produce graduates more likely to settle in underserved areas;

b) Changing reimbursement formulas to make primary care practice in underserved areas more attractive financially;

c) Using restricted scholarship or loan forgiveness programs to make primary care in underserved areas more attractive financially.

An extensive review of these programs exceeds the scope of this paper,[22] but it should be clear that, if properly administered, these strategies are complementary, not competitive. It is precisely those physicians whose undergraduate and graduate training has predisposed them toward primary care in an underserved area who will be most responsive to financial incentives.

To alter the practice decisions of young physicians, either the tastes of young physicians must be changed by altering selection-socialization policies or the financial rewards of alternative careers must be varied. Policies which modify both tastes and constraints stand the best chance of success.

Choosing the best mix of policies requires more information. Assessment of policies designed to affect physicians' career decisions have been significantly hampered by lack of data on physicians' plans, hours of work, and incomes. Much of the conventional wisdom rests on a shaky foundation of inadequate data.

This paper has pointed out the importance of knowing students' plans in assessing the actual or potential impacts of policy decisions. Clearly though, these results must be regarded as preliminary. Evidence from a larger, nationwide sample is needed. Replication and extension of these results should also follow physicians through residency and examine practice locations.

FOOTNOTES

1. See, for example, Manpower Supply and Utilization Branch, Division of Medicine, Bureau of Health Manpower, Supply and Distribution of Physicians and Physician Extenders, Washington, D.C., March 1, 1977.

2. Some argue that because physicians can "create demand," they can settle wherever they wish and earn an adequate income. For a statement of this position see Robert G. Evans, "Supplier-Induced Demand: Some Empirical Analysis and Implications," in The Economics of Health and Medical Care, edited by Mark Perlman, John Wiley and Sons, New York, 1974. The merits of this position are the subject of considerable debate.

3. Fein, Rashi, "Studies on Physician Supply and Distribution," American Journal of Public Health, 44, (1954), pp. 615-624.

4. In 1976-1977, the states provided nearly three-fifths of total medical school revenue. For details see Medical Education in the United States, 1977-1978, Table 32, p. 2834.

5. Fein, Rashi, and Gerald I. Weber, Financing Medical Education, McGraw-Hill Book Company, New York, 1971, pp. 256-257 and 161-162.

6. To the extent that the most serious maldistributions occur within, rather than between, states, this conclusion holds with greater force.

7. For an extensive review see Hadley, Jack, Models of Physicians' Specialty and Location Decision, Technical Paper No. 6, National Center for Health Services Research, 1975. The seminal paper was Weiskotten, Herman G., Walter S. Wiggins, M.E. Alterderfer, M. Gooch, and Anne Tipner, "Trends in Medical Practice: An Analysis of the Distribution and Characteristics of Medical College Graduates, 1915-1950," Journal of Medical Education, 35, (1960), pp. 1071-1121.

8. Yett, Donald E., and Frank A. Sloan, "Migration Patterns of Recent Medical School Graduates," Inquiry (1974), pp. 125-142.

9. Ibid., p. 132

10. Checker, Armand, "State Funding for Targeted Programs in Graduate Medical Education," Journal of Medical Education, 49, (1974), pp. 620-622.

11. Lee, Robert H., "Location, Quality, and Information in Medical Residency Selection," unpublished Ph.D. dissertation, The Johns Hopkins University, 1979, Chapter Nine.

12. Fein and Weber, op. cit. p. 157.

13. From a statistical point of view, it can be argued that the Yett-Sloan model is not truly "recursive," hence it lacks desirable statistical properties. For a discussion of this issue, see Jan Kmenta, Elements of Econometrics, The Macmillan Company, New York, 1971, p. 586.

14. This conclusion is drawn from responses to the open-ended question, "If you were starting practice today, where would you most like to live and work? Be as specific as you can." Students' responses were coded as "don't know," "region," "state," "specific area," "or "several specific areas." Except for "specific area," the coding is straightforward. To be coded a "specific area" respondent, a student had to mention a city, town, county, or area within a state. "York, Pennsylvania;" "Western Massachusetts;" and "Baltimore County, Maryland" typify such responses. Questionable responses were routinely coded as the less specific answer.

15. Locale data were derived from the question

> If you were starting practice today, in what sort of locale would you most like to live and work?
>
> [ ]...a rural area or small town
> [ ]...a town (between 10,000-50,000 people)
> [ ]...a small city (between 50,000 and 500,000 people)
> [ ]...a city

16. Including career preferences in the equation was deemed inappropriate, since career and location preferences are seen as being jointly determined, so that no causal inferences can be drawn. Most of the variables included in the regression have been shown elsewhere (Lee, 1979, p. 150) to affect career preferences. The partial effect of including a measure of career preferences was, moreover, not significant.

17. Students who obtained residencies outside the plan were asked to list the programs to which they applied.

18. Goodness-of-fit was tested using a standard likelihood ratio test.

19. The importance of spouses' plans can be expected to increase. First, more physicians' wives are likely to demand consideration of their career goals. Second, more women are becoming physicians, and their husbands are likely to be career-oriented professionals. Both trends increase the proportion of spouses committed to careers.

20. Not all physician shortage areas can support a conventional hospital-based residency program of acceptable quality. In particular small hospitals may be unable to support enough residents, students, or physicians to maintain an independent program. Either shared programs or programs based in physicians' offices may be alternatives.

21. See: Becker, Howard S., Blanche Geer, Everett C. Hughes, and Anselm L. Strauss, Boys in White, University of Chicago Press, Chicago, (1961).

Heine, Ralph W., "The Internship: Factors in Choice and Level of Satisfaction," Journal of Medical Education, 35 (1960), pp. 404-408.

Paiva, Roslia E. A., Harold B. Haley, and Isabel R. Juan, "Factors in Internship Choice," Journal of Medical Education, 49, (1974), pp. 343-350.

Sappenfield, Robert W., Michael Moskowitz, Pamela Allison, and William Stewart, "Statewide Physician Manpower Planning in Louisiana: Investigation of Stated Reasons Why Physician Trainees Select Louisiana for Practice," The Journal of the Louisiana State Medical Society, 127, (1975), pp. 117-124.

Saunders, Richard H., "The University Hospital Internship in 1960: A Study of the Programs of 27 Major Teaching Hospitals," Journal of Medical Education, 36, (1961), pp. 561-576.

22. For a full review, see Medical Education Financing: Issues and Options for the 1980s, edited by Jack Hadley, Neale Watson Academic Press, New York, (forthcoming).

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